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The Omnibus Personality Inventory (OPI) was administered to 76 volunteer graduating seniors at the University of Kentucky to investigate the dimensions of personality change through a factor analysis of independent change scores. These change scores were obtained by comparing the OPI scores of the students as freshmen with those scores of the same students as seniors. The Thinking Introversion, Theoretical Orientation, Estheticism, Complexity, Automony, Impulse Express, Schizoid Functioning, Social Introversion, Religious Liberalism, and Masculinity-Femininity scales were included in the analysis. Change scores were analyzed into the following factors: humanistic thinking, intellectual and social liberalism, emotional growth, tolerance for ambiguity, interpersonal rationality, and masculinity-femininity. Major change was found to occur in the direction of humanism and intellectual and social liberalism, selectivity of associates, and less rigid stereotyping of sex role. Change was not found to be a factor of different curricular offerings when cross-products factor analysis between 14 engineering students' scores were compared with those of 26 students in Arts and Sciences and Commerce. (WR)

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Several investigators have demonstrated that change occurs in personality test scores during the college years (Lehmann, 1963; Stewart, 1964; Webster, Freedman, & Heist, 1962). In fact, Plant (1965) showed that personality test scores change independently of educational experience. The research question asked in typical studies of personality change among college students is: does change occur? Typically, also, tests of significance of the differences for correlated means have been used to infer change. In such research designs the focus is on average change between pre-test and post-test groups.

Grant, however, that change does occur and a different research question may be asked: what are the characteristics of the change? This question is concerned with individual differences in change as contrasted to average change and may be investigated appropriately by factor analysis.

Questions dealing with psychological change have presented researchers with major statistical problems. A lucid explanation of some of these problems has been given by Bereiter (1963). Tucker et al (1966) have proposed a method for obtaining a base-free measure of psychological change which they call an "independent change score." These authors also discussed the logic and appropriate use of ratio, difference, and independent change scores.

This study is concerned with an investigation of the dimensions of personality change through a factor analysis of independent change scores.

Procedure

Invitations to take the Omnibus Personality Inventory (OPI), Form C, were sent to a random sample of 350 graduating seniors who had taken the OPI as freshmen. Seventy-six (22 per cent) students, 40 males and 36 females, responded.

The following scales on the OPI were included in the analysis: Thinking Introversion, Theoretical Orientation, Estheticism, Complexity, Autonomy, Impulse Expression, Schizoid Functioning, Social Introversion, Religious Liberalism, and Masculinity-Femininity. The origin and development of these scales is given in the Omnibus Personality Research Manual (1962). The Developmental Status, Social Maturity, and Repression-Suppression scales were not used because of the large amount of item overlap between these three scales and the others.

An independent change score was computed for each student by the procedure suggested by Tucker et al (1966). Subsequently, the change scores were factor analyzed by the principal components method and rotated to the varimax criterion. Definition of factors was determined by a multiple correlation procedure in which OPI scale intercorrelations constituted the independent variables and the factor weight the dependent variable (Nunnally, 1967, p. 357).

Results

The factor loadings and the per cent of variance accounted for by each factor are presented in Table 1.

Table 1

Principal Axes Loadings: Varimax Rotation

OPI Scales	Factors						
	I	II	III	IV	V	VI	h^2
Thinking Introversion	92	04	-06	-01	-16	-03	88
Theoretical Orientation	23	17	16	-12	-78	21	78
Estheticism	66	-04	29	-05	-08	-55	84
Complexity	-03	-05	-03	98	-03	00	96
Autonomy	14	88	-21	-02	-04	03	85
Impulse Expression	10	14	84	01	-12	04	75
Schizoid Functioning	-03	-11	76	-03	20	-26	70
Social Introversion	01	04	29	-32	73	31	82
Religious Liberalism	-17	76	39	-04	-14	04	79
Masculinity-Femininity	-12	02	-10	-02	-03	93	88
Per Cent of Total Variance	21	17	17	11	9	7	

The first factor was labeled "Humanistic Thinking" because of its loading on the scales of Thinking Introversion and Estheticism. The multiple correlation of these two scales with the factor was .90 (shrunken .89).

The second factor, "Intellectual and Social Liberalism," derived its meaning from the scales of Autonomy and Religious Liberalism, and its R was .98 (shrunken .97).

The third factor provided an R of .91 (shrunken .90) and was defined by the Impulse Expression and Schizoid Functioning scales. This factor was named "Emotional Growth."

The fourth factor was called "Tolerance for Ambiguity" because of its loading on the Complexity scale. The correlation of this scale with the factor was .96 (shrunken .94).

The interpretation of the fifth factor was less easily derived, since it loaded positively on Social Introversion and negatively on Theoretical Orientation. It was named "Interpersonal Rationality" and provided an R of .93 (shrunken .92).

Factor VI derived its meaning from the Masculinity-Femininity scale and its correlation with the factor was .90 (shrunken .89).

Discussion

Perhaps the most significant implication suggested by this analysis is that the changes found in the first four factors resemble the outcomes of those humanistic goals of higher education whose lineage can be traced to the Golden Age of Greece.

In these cynical times, it has become popular to emphasize the discrepancies between stated goals of higher education, found in every college catalogue, and the increasing fragmentation of the curriculum in the attempt of state-supported institutions to be all things to all people. The impersonality which inevitably accompanies burgeoning enrollments has led students, faculty, and administrators to question even the possibility of making an impact upon the student's value structure. As Dressel (1965) has succinctly pointed out, the role of higher education in value change must be a limited one. Nonetheless, his emphasis upon process values, i.e., those which relate to the manner in which judgments are made and decisions arrived at, seems to be not only theoretically feasible but also practically obtainable, in view of these findings.

Particularly at this time when science seems to have overwhelmed humanity, when computers exercise all but ethical judgment, it is reassuring to find indications that major change occurs among college seniors in the direction of humanism and intellectual and social liberalism. This becomes more meaningful when account is taken of the heterogeneity of the small sample. Of the 40 male students, 14 were engineers, 18 were Arts and Sciences seniors, and 8 were Commerce seniors. One-third of the Arts and Sciences males were physical science majors. The

distribution of majors among the girls was 14 physical science majors, 9 humanistic and social science majors, and 13 majors in education.

Factors V and VI require a special comment because of their bipolarity. Factor V, Interpersonal Rationality, at the positive end of the continuum suggested movement toward one of Maslow's criteria for self-actualization, i. e., selectivity of associates. At the negative end of the continuum it represents withdrawal from people because of inability to discriminate and make choices among them. The direction of the changes achieved by this sample allowed an interpretation toward the positive end of the dimension.

Factor VI, Masculine Role, was interpreted positively as a less rigidly stereotyped sex role since the direction of the changes in this sample would have produced scores interpretable as a less exaggerated sex identification. Scores at the negative end of this continuum would represent a rejection of cultural values and a continuation of utilitarian and habitual values.

Change might be expected to vary as a function of different curricular offerings, which range from the highly structured Engineering program through the less structured Commerce curriculum to the unstructured liberal arts program. A direct test of this assumption was made by comparing the change scores achieved by the 14 engineers to those of the 26 Arts and Sciences and Commerce males. The change scores on the ten OPI scales were subjected to the cross-products factor analysis described by Nunnally (1967, Pp 372-425). This technique of profile analysis produced the plot of students presented in Figure 1, in which the two dimensions plotted accounted for 84 per cent of the total variance.

Insert Figure 1 about here

It is apparent from an inspection of these data that engineering seniors, as a group, do not change differentially from other males. Of course, it is recognized that change results from complex factors and is not exclusively a product of the classroom. In fact, it has been said that true education consists of what remains after the content of courses has been forgotten.

Izard (1962), however, found that differing curricula at Vanderbilt resulted in differential changes for males as measured by the Edwards Personal Preference Schedule. It is possible that the method of assessing the amount of change, rather than the actual change itself, produced findings contradictory to those of this study.

The results of this study verify the findings of others, i. e., change does occur. More importantly, though, they suggest a valuable methodology for an investigation of the dimensions involved in change. The factor structure of freshman OPI scores (Elton and Rose, 1966) is markedly different from the data presented in Table 1. Furthermore, although it would have to be assumed from Plant's (1965) data that change occurs irrespective of the number of semesters completed, it does not have to be assumed that the dimensions of change are similar for each year or semester of college completed.

For the students in this study, personality test score change would seem to consist primarily of Humanistic-Thinking, Intellectual and Social Liberalism, Emotional Growth, and Tolerance for Ambiguity. Also noteworthy indications are the growth of their selectivity of people as friends and the less exaggerated acceptance of their sex roles.

The face of change as described in these findings cannot be presumed to be universal; the small number of subjects, the use of volunteers, and the absence of cross-validational data mitigate against overgeneralization. Nonetheless, these findings suggest the importance of further study of value change in higher education.

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